

REMARKS

Applicants have amended claims 1 and 9 to more particularly point out and distinctly claim the subject matter of this invention. Each of claims 1 and 9, as amended, now recites an organic part and/or organic linkage groups. Support for the former can be found at page 11, line 17 through page 12, line 14 and support for the latter appears at page 12, line 19 through page 12, line 14. Applicants have canceled claims 2, 8, 12 and 13, since all of the limitations in these claims have been incorporated into amended claim 1, from which claims 2, 8, 12 and 13 depend. The cancellation has necessitated change of the dependency of claims 3-7 and claim 9, which formerly depended from canceled claims 2 and 8, respectively. Applicants have added a new claim, i.e., claim 16. Support for the claim can be found at page 12, lines 1-17. Applicants have also amended claims 4, 7, 10 and 15 to rectify deficiencies and promote clarity. Finally, Applicants have amended the Specification to correct minor deficiencies. No new matter has been introduced by the amendments.

Claims 1, 3-7, 9-11, and 14-16 are currently pending. Reconsideration of this application, as amended, is respectfully requested in view of the remarks below.

Objection

The Examiner objects to claim 4 on the ground that the term "trialkylmonoalkoysilane" is informal. Applicants have replaced "trialkylmonoalkoysilane" with "trialkylmonoalkoxysilane" in claim 4, as well as in the Specification.

At the Examiner's request, Applicants have rectified several informalities in the Specification.

Rejection under 35 U.S.C. § 112, first paragraph

Claim 1 is rejected as failing to comply with the enablement requirements. More specifically, the Examiner points out that the use of a silyl group containing material as a pore-forming material is critical or essential to practicing the claimed invention, but is not recited in claim 1. Applicants have amended claim 1 to recite a silyl group containing pore-forming material. Support for the amendment can be found at page 11, line 7 through page 12, line 17 of the Specification.

Rejection under 35 U.S.C. § 112, second paragraph

Claims 7 and 10 are rejected as being indefinite. More specifically, the Examiner points out that the phrase "the hydrosilylation" recited in claim 7 and the phrase "the addition of water and catalyst" recited in claim 10 have no antecedent basis. Applicants have amended claims 7 and 10 to rectify the deficiencies.

Rejection under 35 U.S.C. §102 (a)

Claim 1 is rejected as being anticipated by four prior art references cited in the Specification, i.e., Brinker et al., US Patent 4,652,467 (Brinker et al.); Sakamoto et al., US Patent 5,103,288 (Sakamoto et al.); Nguyen et al., Chem. Mater. 1999, 11, 3080 (Nguyen et al.); and Mikoshiba et al., J. Mat. Chem. 1999, 9, 591 (Mikoshiba et al.).

Claim 1, as amended, covers a process of preparing a porous wiring interlayer insulating film. The process includes three steps: (1) preparing a mixed complex of a matrix resin and a thermally decomposable pore-forming material, (2) coating the mixed complex on a substrate, and (3) heating the mixed complex to decompose the pore-forming material to form pores in the complex. The pore-forming material is a compound having (i) one or more silyl functional groups at its terminals, and (ii) an organic part including thermally decomposable organic linkage groups. When heated, the organic linkage groups decompose. As a result, the organic part is removed from the mixed complex to form pores. In other words, in the process of claim 1, pores are formed by removing an organic part of a pore-forming material.

Brinker et al. discloses a method of coating a substrate with a porous film using a sol-gel technology. The method includes (1) depositing a thin film on the substrate from a non-gelled solution containing at least one hydrolysable metal alkoxide of a polymeric networking cation, water, a suitable solvent, and an acid or base; (2) curing the film by evaporating a sufficient quantity of the solvent to cause gelation; and (3) heating the film to form a cross-linked polymer. In this method, pores result upon evaporation of the solvent. See column 3, lines 58-60. In contrast, in the process of claim 1, pores are formed by removing an organic part of a pore-forming material. Thus, Brinker et al. does not anticipate claim 1.

Sakamoto et al. discloses a method of coating a low density dielectric porous film on a substrate. The method includes (1) depositing on a substrate a mixture of an acidic oxide and a basic oxide, (2) heating the mixture to precipitate the basic oxide, and (3) dissolving out the basic oxide. In this method, pores are generated after the basic oxide is dissolved out. Since the process of claim 1 requires removing an organic part of a pore-forming material to form pores, claim 1 is clearly not anticipated by Sakamoto et al.

Nguyen et al. describes a method of coating a porous organosilcate film. The method includes (1) spin-coating a mixture of a matrix material and a thermally labile polymer, and (2) thermally curing the mixture and initiating decomposition of the polymer. The polymer disclosed in Nguyen et al. is a star-shaped hydroxy-terminated poly(ϵ -caprolactone). In contrast, the pore-forming material recited in claim 1 is a compound having silyl functional groups at its terminals. Thus, claim 1 is not anticipated by Nugyen et al.

Mikoshiha et al. describes a method of coating a porous poly(methylsilsequioxane) film on a substrate. This method includes (1) preparing a copolymer from methyltrisiloxysilane and trisiloxysilane having a trifluoropropyl group, (2) spin-coating the copolymer on the substrate, and (3) heating the copolymer to remove the trifluoropropyl group to form pores. In contrast, the process of claim 1 requires using a pore-forming material having thermal decomposable organic linkage groups. The organic linkage groups are defined in the Specification, page 11, line 19 through page 12, line 12. They do not include a trifluoropropyl group as required by the method of Mikoshiha et al. Thus, claim 1 is not anticipated by Mikoshiha et al.

Rejection under 35 U.S.C. § 102 (b)

Claims 1-15 are rejected as being anticipated by Ioka et al, EP 0997497 (Ioka et al.). Claims 2, 8, 12, and 13 have been canceled. Among the remaining claims, claim 1 is the only independent claim and will be discussed first.

As discussed above, amended claim 1 covers a process of preparing a porous film with a matrix resin and a pore-forming material. The matrix resin is a silyl group-containing material. The pore-forming material is a compound having two parts: (1) a silane part including one or more silyl functional groups, and (2) an organic part including thermally decomposable organic linkage groups. The pore-forming material is connected with the matrix resin by covalent

bonding between its silyl functional groups and the silyl groups of the matrix resin.¹ When heated, the organic part of the pore-forming material decomposes and is removed to form pores. The silane part remains in the porous film since the silyl functional groups in the silane part are covalently bonded to the matrix. In other words, only **a part of the pore-forming material** is removed to form pores.²

Ioka et al. discloses a polymer composite containing (1) alkoxysilane, (2) an organic polymer, such as polyether or polyester, and (3) a solvent. It further discloses a method of producing a porous thin film from a polymer composite. The method includes (1) forming a thin film by cross-linking of the alkoxysilane, and (2) heating the thin film to remove the organic polymer to form pores. In this method, **an alkoxysilane molecules are cross-linked to each other** to produce a gel, which is dried to form a thin film. An organic polymer is dispersed in the thin film, but is not covalently bonded to alkoxysilane.³ When the thin film is heated, “the **organic polymer** [] is removed from the thin film” to form pores (Emphasis added). See page and page 11, lines 30-34. Note that the alkoxysilane and the organic polymer are equivalent to the matrix resin and the pore-forming material recited in claim 1, respectively. Unlike the process of claim 1, the method disclosed in Ioka et al. requires that **a matrix resin is cross-linked to each other** rather than to a pore-forming material. Additionally, this method requires that **the entirety of the pore-forming material is removed to form pores**, rather than only a part of the pore-forming material is removed to form pores. Since the process of claim 1 requires that **a pore-forming material is connected with a matrix resin by covalent bonding and a part of the organic polymer** is removed to form pores, claim 1 clearly is not anticipated by Ioka et al.

¹ In the first step of the process of claim 1 (the preparing step), a cross-linking reaction takes place between molecules in a matrix resin and molecules in a pore-forming material. See page 12, line 18 through page 13, line 4. As a result, the silyl functional groups in the pore-forming material are covalently bonded to the silyl groups of the matrix resin.

² The figure on page 18 of the Specification shows a porous thin film structure. The organic part is removed to form pores. The silyl function groups remain in the porous thin film and are still covalently bonded to the matrix resin.

³ Ioka et al. discloses a “hydrolysis and dehydration condensation reaction with respect to the alkoxysilane.” See page 10, lines 11-12. In this reaction, an alkoxysilane molecule is cross-linked to another alkoxysilane molecule via Si-O-Si bonding. In a repeated manner, a poly-alkoxysilane molecule is formed. The organic polymer is not involved in the above reaction. Thus, it does not covalently bond to the alkoxysilane.

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Serial No. : 09/844,553
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Page : 13 of 13

Attorney's Docket No.: 13135-002001 / OPP 010372
US

For the reasons set forth above, claims 3-7, 9-11, 14, and 15, dependent from claim 1, are also not anticipated by Ioka et al.

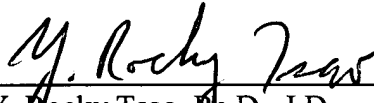
CONCLUSION

For the reasons set forth above, Applicants submit that the grounds for the rejections asserted by the Examiner have been overcome, and that the claims, as pending, define subject matter that is novel over the prior art. Applicants ask that all claims be allowed.

Enclosed is a \$420 check for the Petition for Extension of Time fee. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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